WHAT IS CLAIMED IS:

1. A crystalline silicon thin film semiconductor device comprising:

a conductive substrate or a substrate having on its surface a conductive layer;

a crystallographically oriented first polycrystalline silicon layer which has been formed by introducing a metal catalyst element into an amorphous silicon layer, formed on the surface of the conductive substrate or the conductive layer, or so as to come into contact with the surface portion of the amorphous silicon layer, and heat treating the amorphous silicon layer to crystallize the amorphous silicon layer; and

a second polycrystalline silicon layer which has been formed, using the first polycrystalline silicon layer as a seed crystal, so as to have the same conductivity type as the first polycrystalline silicon layer.

2. The crystalline silicon thin film semiconductor device according to claim 1, wherein the second polycrystalline silicon layer contains not less than 0.1% of hydrogen.

3. The crystalline silicon thin film semiconductor device according to claim 1, wherein the second polycrystalline silicon layer is crystallographically oriented in the thicknesswise direction.

4. The crystalline silicon thin film semiconductor device according to claim 1, wherein the second polycrystalline silicon layer has the same crystallographic orientation as the first polycrystalline silicon layer.

SUB C1

5. The crystalline silicon thin film semiconductor device according to claim 1, which further comprises, provided on the second polycrystalline silicon layer in its side remote from the first polycrystalline silicon layer, a third polycrystalline silicon layer of a second conductivity type which is different from the conductivity type of the second polycrystalline silicon layer.

6. The crystalline silicon thin film semiconductor device according to claim 5, which further comprises, provided between the third polycrystalline silicon layer and the second polycrystalline silicon layer, a fourth polycrystalline silicon layer of a third conductivity type which is different from the conductivity type of the second polycrystalline silicon layer and the conductivity type of the third polycrystalline silicon layer.

7. The crystalline silicon thin film semiconductor device according to claim 5, wherein the third polycrystalline silicon layer has the same crystallographic orientation as the second polycrystalline silicon layer.

8. The crystalline silicon thin film semiconductor device

according to claim 6, wherein the fourth polycrystalline silicon layer has the same crystallographic orientation as the second polycrystalline silicon layer.

9. The crystalline silicon thin film semiconductor device according to claim 6 or 8, wherein the fourth polycrystalline silicon layer has the same crystallographic orientation as the third polycrystalline silicon layer.

10. The crystalline silicon thin film semiconductor device according to claim 5 or 6, wherein the third and fourth polycrystalline silicon layers contain not less than 0.1% of hydrogen.

11. A crystalline silicon thin film photovoltaic device comprising:

a conductive substrate or an insulating substrate having on its surface a conductive layer;

a first polycrystalline silicon layer of a first conductivity type which has been formed by introducing a metal catalyst element into an amorphous silicon layer, formed on the surface of the conductive substrate or the conductive layer, or so as to come into contact with the surface portion of the amorphous silicon layer, and heat treating the amorphous silicon layer to crystallize the amorphous silicon layer;

a second polycrystalline silicon layer which has been formed, using the first polycrystalline silicon layer as a seed crystal, so as to have the same conductivity type as the first

conductivity type;

a substantially i-type third polycrystalline silicon layer provided on the second polycrystalline silicon layer;

a fourth polycrystalline silicon layer that is provided on the third polycrystalline silicon layer and is of a second conductivity type which is different from the first conductivity type; and

an electrode part provided on the fourth polycrystalline silicon layer.

12. The crystalline silicon thin film photovoltaic device according to claim 11, wherein

the conductive substrate is stainless steel; and

the substrate having on its surface a conductive layer is glass.

13. A crystalline silicon thin film photovoltaic device comprising:

an insulating substrate having on its surface an electrode;

a first polycrystalline silicon layer of a first conductivity type which has been formed by introducing a metal catalyst element into an amorphous silicon layer, formed on the electrode of the insulating substrate, or so as to come into contact with the surface portion of the amorphous silicon layer, and heat treating the amorphous silicon layer to crystallize the amorphous silicon layer;

a second polycrystalline silicon layer which has been

formed, using the first polycrystalline silicon layer as a seed crystal, so as to have the same conductivity type as the first conductivity type;

a third polycrystalline silicon layer which is provided on the second polycrystalline silicon layer and is of a second conductivity type which is different from the first conductivity type; and

an electrode part provided on the third polycrystalline silicon layer.

14. A process for producing a crystalline silicon thin film semiconductor device, comprising the steps of:

providing a conductive substrate or a substrate having on its surface a conductive layer and forming an amorphous silicon thin film on the surface of the conductive substrate or the surface of the conductive layer in the substrate;

introducing a metal catalyst element into the amorphous silicon layer or so as to come into contact with the surface portion of the amorphous silicon layer, and heat treating the amorphous silicon layer to crystallize the amorphous silicon layer and to form a crystallographically oriented first polycrystalline silicon layer;

forming, on the first polycrystalline silicon layer, a second polycrystalline silicon layer, of the same conductivity type as the first polycrystalline silicon layer, using the first polycrystalline silicon layer as a seed crystal; and

forming, on the second polycrystalline silicon layer, a third polycrystalline silicon layer of a second conductivity

type which is different from the conductivity type of the second polycrystalline silicon layer.

15. The process according to claim 14, wherein the amorphous silicon layer contains not more than 0.3% of hydrogen.

16. The process according to claim 14 or 15, wherein the amorphous silicon layer has a thickness of not more than 50 nm.